

CRUSH GRINDER PEPPER MILL

TURNING INSTRUCTIONS

Duey Marthaller

1. Blank Size

For maximum height mill, 3 ¼ X 3 ¼ X 13 inches. This size gives some leeway, If it is a uniform blank, 3 X 3 will work.

2. Completed Grinder Size

Overall maximum = 11 inches, 9-inch base and 2-inch top. Any size can be made down to a base of 3 ½ inches tall. Bed of lathe will limit size. A 24-inch bed is needed for a mill of about 9 inches tall. A typical size is 8 to 10 inches tall.

3. Turning Steps

- A. Round blank between centers with roughing gouge.
- B. Use a parting tool to make a tenon at one end. Match the tenon diameter as close as possible to the mid range of the chuck jaw holding diameter. Use a slight dovetail shape or make it straight if the jaws are serrated and not dovetailed. The tenon should not bottom out in the jaws.
- C. Place in chuck and tighten. Carefully square off the free end. Take very light cuts. The indentation from turning between centers must be removed because bringing up the tail stock or engaging a Forstner bit could pull the blank off center.
- D. Bring up the tail stock with a live center and support the blank.
- E. True up the blank using the tool of your choice, roughing gouge, bowl gouge or spindle gouge. Some shaping can be done here if desired.
- F. With sharp Forstner bits, drill the holes to the depth dimensions shown on the drawings. A bit extension will be needed. Do not drill to a depth past the height of the bottom section. Leave about 1 ½ inches to be drilled from the other end. For example, if the bottom section is to be 8 inches, drill in a total of about 6 to 6 ½ inches.
- G. Sand the bottom of the blank to about 150 grit.
- H. Bring in the tail stock with a cone support. A cone support can turned from a piece of wood if necessary.
- I. Finish turning and sanding base section to correct dimensions and desired shape.
- J. Part off at the top of the base section and set aside.
- K. The remaining wood in the chuck will be used to form the top.
- L. Square off free end and sand to 150 grit.
- M. Drill hole in top according to diagram.
- N. Finish turning a much as possible of the top using dimensions from diagram and top template.

- O. Part off. Leave a small nub on the top so end grain is not torn out at the center.
- P. Make a jam chuck from a waste block that will fit the bottom of the top section so the very top can be finished.
- Q. Fit the bottom of the base into expanding chuck jaws or contracting jaws. If contracting jaws are used, use a layer of rubber to protect the piece. Plumbers' rubber gasket sheets work well for this.
- R. Use an inverted cone in a live center to support the free end before the jaws are tightened. Tighten the jaws and remove the inverted cone. Test to see if the piece turns true. Try the process again if it does not run true.
- S. Carefully true up the free end. Remove minimum material. Drill a hole with a Forstner bit of the right diameter. Drill so the hole is continuous through the mill.
- T. Sand the end and remove from the chuck. Turning is complete.

4. Install Crush Grinder Mechanism

- A. Measure the distance from the bottom lip (not the bottom of the base, but the first shoulder up from the bottom) inside the base to the top of the base.
- B. Add 1 ¼ inches. Mark this distance on the grinder shaft, measuring up from the **top** of the bottom lip.
- C. Cut the shaft at this point.
- D. File and sand the top of the stem to remove sharp edges.
- E. Glue mechanism into base using 5-minute epoxy. Wax top portion of stem so it slides into top section easier. Place glue on wood surface and slide mechanism in.

DESIGNING THE MILL

The crush grind mill has several unique features that must be taken into consideration when designing your mill.

- The maximum body height is 9".
- The minimum height of the body is 3 1/2". Note that the shaft will need to be cut with a hacksaw for body heights less than the maximum (explained in assembly section).
- The minimum finished height of the head is 1 1/2".
- Make a simple sketch for your design and all of the different holes before you start (Fig. 1). This will help to familiarize you with the boring and turning process.

PREPARING THE BLANK

- Select a block of wood about 2 3/4" x 2 3/4" and at least 1" longer than the length of the mechanism.
- Mount the blank between centers of the lathe and rough turn to about 2 1/2" diameter.
- Square the end of the blank with a parting tool.
- Using a pencil, mark the body and head locations of your design onto the blank.
- Use a parting tool and cut down the parting line between the body and head, stopping when about 3/4" of wood is left.
- Stop the lathe and finish cutting with a handsaw.

BORING THE MILL BODY

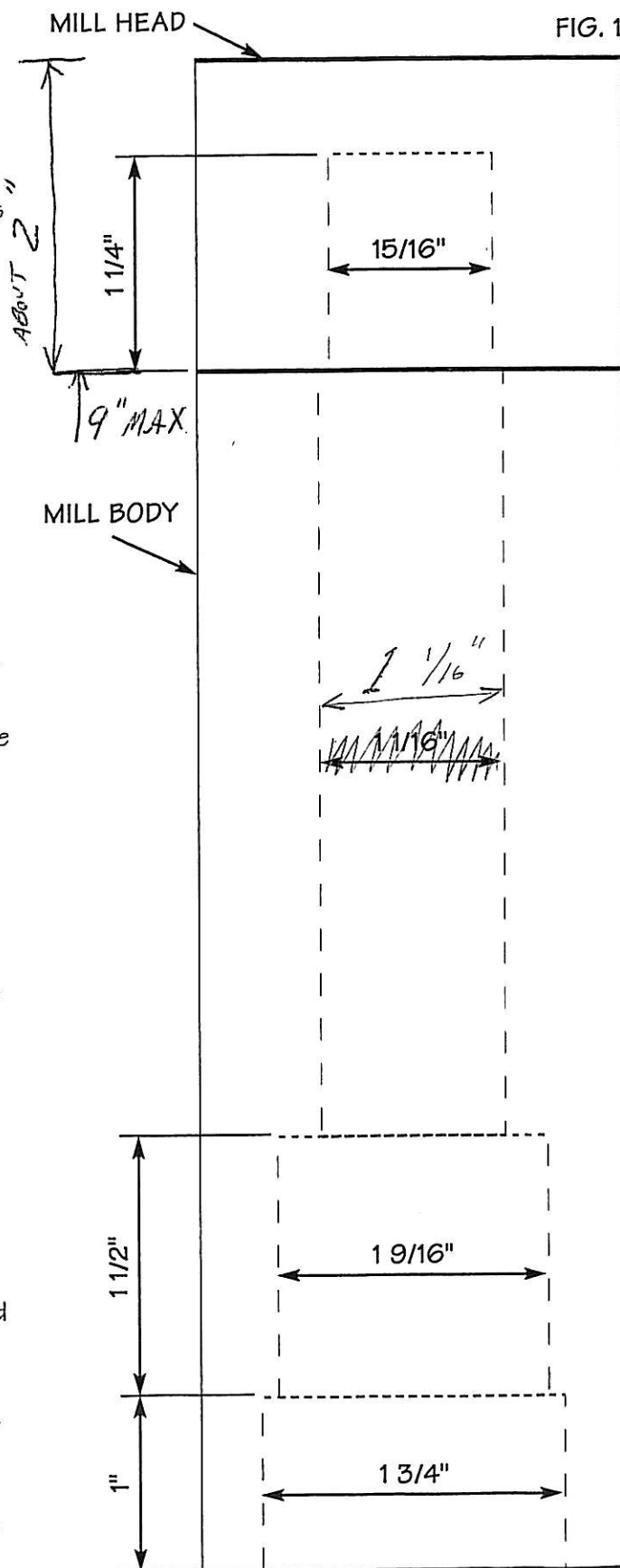
- Bore a 1 3/4" hole 1" deep into the base of the mill body.
- Use the center mark from the previous hole and bore a 1 9/16" hole 1 1/2" further into the blank (2 1/2" overall).
- Bore a 1 1/16" hole using the center mark from the previous hole and drill completely through the mill body.

BORING THE MILL HEAD

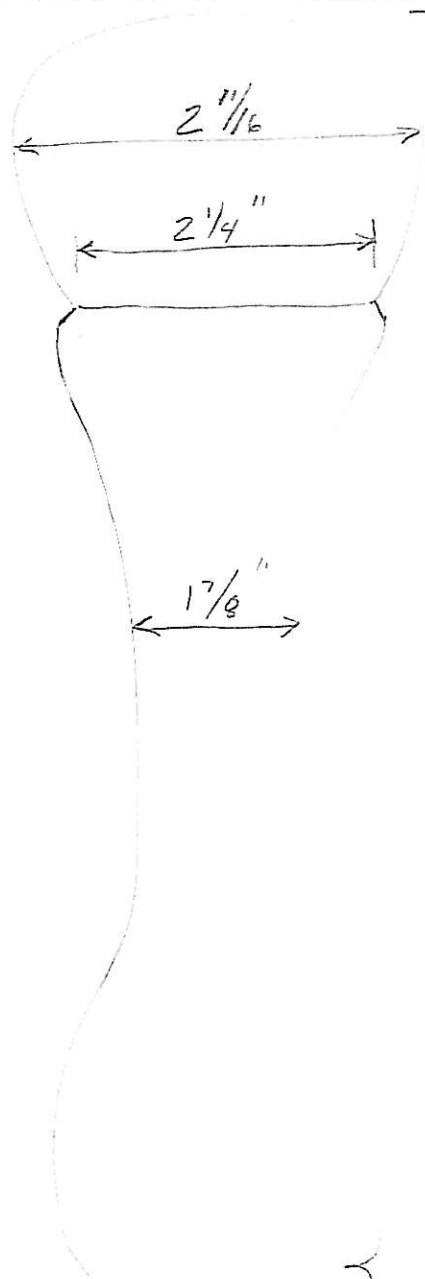
- Bore a 15/16" hole 1 1/4" deep into the bottom of the mill head.

TURNING THE MILL BODY

- Mount the body between centers using a drive tenon and cone center as shown in Figure 2 (on back). To make a drive tenon, mount a 2" to 3" diameter by 2" thick waste block on the lathe with a chuck or faceplate. Turn a 1/4" long tenon to fit snugly into the 1 3/4" hole. Leave a small shoulder around the tenon.
- Turn, sand and finish the body according to your sketch. Remember the internal holes in order to maintain sufficient wall thickness.



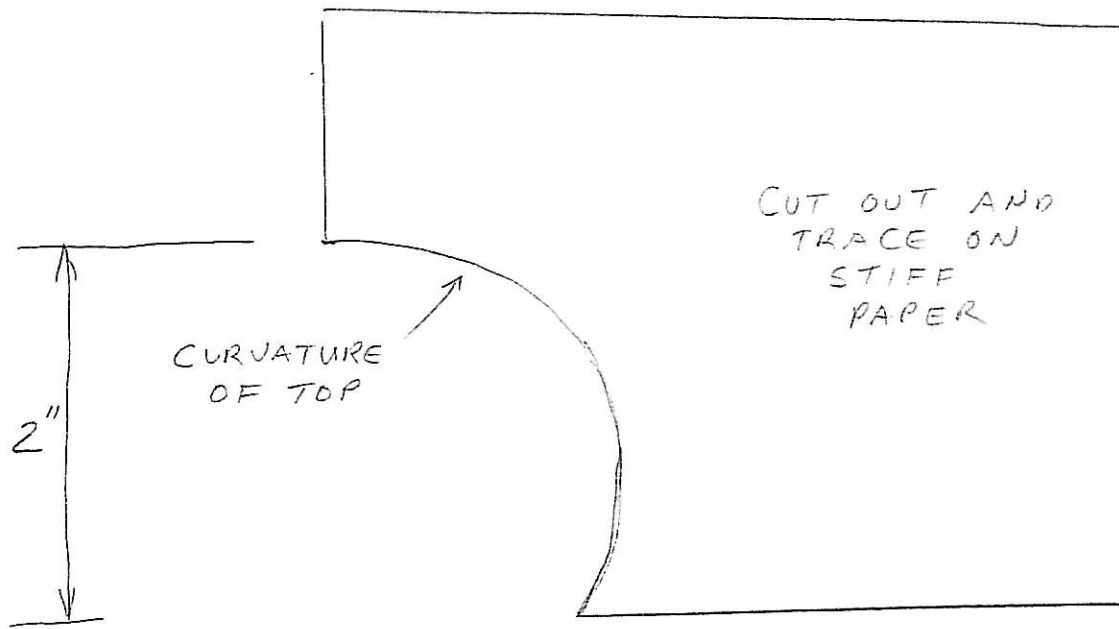
9"
(MAX)



$1\frac{3}{4}$ " TO 2"

NOT TO
SCALE

$2\frac{1}{4}$ "



TOP TEMPLATE